EXHIBIT 6

DECLARATION OF IRENE YANG IN SUPPORT OF HUAWEI'S OPPOSITION TO SAMSUNG'S MOTION TO STRIKE PORTIONS OF HUAWEI'S EXPERT REPORTS

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

HUAWEI TECHNOLOGIES CO., LTD., HUAWEI DEVICE USA, INC., and HUAWEI TECHNOLOGIES USA, INC.,

Plaintiffs / Counterclaim-Defendants,

v.

SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC.,

Defendants / Counterclaim-Plaintiffs,

and

SAMSUNG RESEARCH AMERICA,

Defendant,

v.

HISILICON TECHNOLOGIES CO., LTD.,

Counterclaim-Defendant.

Case No. 16-cv-02787-WHO

EXPERT REPORT OF DR. VENUGOPAL V. VEERAVALLI REGARDING VALIDITY OF U.S. PATENT NO. 8,416,892

Dated: May 25, 2018 **Signed:**

Dr. Venugopal V. Veeravalli

8, 2011, claims priority to Chinese patent application 200710074200.1. '892 Patent at Cover at Cover.

C. Priority Date of the '892 Patent

59. Dr. Madisetti uses the April 22, 2008 filing of the US PCT application as the priority date of the '892 Patent. My understanding is that the proper priority date for the '892 Patent should be the date the Chinese patent application was filed, as shown on the face of the '892 Patent.

60. My understanding is that the Chinese patent application provides priority for the '892 Patent if it discloses the elements of the asserted claims, claims 1 and 10. In my opinion, and as shown below, the Chinese patent application does disclose each of the elements of claims 1 and 10.

61. I have reviewed a certified translation of the Chinese patent application (hereinafter "Translation"). I have used this translation as the basis of my analysis of whether the Chinese patent application discloses all the elements of claims 1 and 10.

62. I understand that Samsung produced a certified translation of the Chinese priority document as well. *See* Samsung Translation (SAMSUNG-HNDCA-000413679-95). I do not speak Chinese. However, I can determine that the Samsung's provided translation is not correct because the numbers and formula in that document do not match the numbers and formula in the original Chinese patent application.

63. For example, the following equation appears in the Chinese patent application:

$$N_{CS}(k) = \left\lfloor N_{ZC} / [64 \times a^k + a/(1-a) \times (a^k - 1)] \right\rfloor$$

'892 File History at HW_Samsung_00038629 (highlighting added).

64. The translation provided by Samsung shows this equation as:

$$N_{CS}(k)=\lfloor N_{ZC}/[65\times a^{k}+a/(1-a)\times(a^{k}-1)]\rfloor$$

Samsung Translation at SAMSUNG_HNDCA-000413691 (highlighting added).

65. As can be seen, even by a non-Chinese speaker, the translation has changed the number 64 in the original formula to 65. The Samsung provided translation also shows the Bates number of the Chinese patent application, making it easier to connect the two equations.

66. This is not the only obvious error in the translation either. The original Chinese priority application includes the mathematical expression N_{ZC}=839:

假设，在 T_{pre} = 800us 的前导中，N_{ZC} = 839，T_s= T_{pre} / N_{ZC}，对于所有小区半径，时延扩展为 5us。在这些条件下，如果保证选择的所述有限集合使任何一个 N_{CS} 值确定的 N_{pre}（R）与从所述有限集合中选择的 N_{CS} 值确定的 N_{pre}（R）之间的最大相对差距最小，且假设任何一个 N_{CS} 值确定的 N_{pre}（R）为 A（R），所述有限集合中选择的 N_{CS} 值确定的 N_{pre}（R）为 B（R），则 A（R）及分别如图 1 所示。

'892 File History at HW_Samsung_00038627 (highlighting added).

67. The Samsung provided translation instead says: N_{ZC}=830:

Assuming that in a preamble where T_{pre}=800 us with N_{ZC}=830 and T_s=T_{pre}/N_{ZC}, the delay spread is 5us. Under such condition, if the limited set which is surely selected results in the minimum difference between the value of $N_{pre}(R)$ determined by any N_{CS} value and the $N_{pre}(R)$ determined by an N_{CS} value selected from the limited set with the $N_{pre}(R)$ determined by any N_{CS} value being $A(R)$ and the $N_{pre}(R)$ determined by an N_{CS} value selected from the limited set being $B(R)$, $A(R)$ and [Sic.] are respectively illustrated in FIG1.

Samsung Translation at SAMSUNG_HNDCA-000413689 (highlighting added).

68. Because of these obvious problems with the Samsung provided translation, I have analyzed the priority of the '892 Patent from the Translation that was provided to me.

69. The following chart shows where each element in claim 1 appears in the Chinese priority application:

Claim	Chinese Priority Application
1. A method of facilitating communication in a mobile communication system, the method comprising:	The present invention provides a method for determining a set of zero-correlation zone lengths, comprising: determining the length of a root sequence; selecting such a set of zero-correlation zone lengths; for any cell radius, the maximum number of preambles determined by a zero-correlation zone length selected from the set of zero-correlation zone lengths selected is the closest to the maximum number of preambles determined by any one zero-correlation zone length selected from set of all integers, wherein the maximum number of preambles is determined by the length of the root sequence and the selected zero-correlation zone length. The present invention also provides a device, a base station, and a mobile communication system for determining a set of zero-correlation zone lengths. In the present invention, a finite set of selected ZCZ lengths should satisfy certain conditions, which provides a technical solution for selecting a finite set of relatively good ZCZ lengths, thereby reducing signaling overhead. [Translation at p. 1] The present invention relates to a random access preamble technique in a mobile communication system, and more particularly to a technique for determining a set of zero-correlation zone lengths. [Translation at p. 6] In order to obtain better detection characteristics of preambles, or to accurately estimate the arrival time of uplink signals, a preamble set should be designed to have good autocorrelation and cross-correlation characteristics. [Translation at p. 6] The present invention further provides an embodiment of a mobile communication system comprising: a base station and a mobile terminal; the base station is used for designating a zero-correction zone length in a set of zero-correction zone lengths to the mobile terminal; the mobile terminal is used for generating a preamble based on the zero-correction zone length designated by the base station and sending an uplink signal to the base station by using the preamble; the set of zero-correction zone lengths is such a set of zero-correlation zone lengths; for any cell radius, the maximum number of preambles determined by a zero-correlation zone length selected from the set of zero-correlation zone lengths selected is the closest to the maximum number of preambles determined by any one zero-correlation zone length selected from a set of all integers, wherein the maximum number of preambles is determined by the length of the root sequence and the selected zero-correlation zone length. [Translation at p. 13]

Claim	Chinese Priority Application
selecting, by a user equipment (UE), a random access preamble from a set of random access preambles; and	The present invention further provides an embodiment of a mobile communication system comprising: a base station and a mobile terminal; the base station is used for designating a zero-correction zone length in a set of zero-correction zone lengths to the mobile terminal; the mobile terminal is used for generating a preamble based on the zero-correction zone length designated by the base station and sending an uplink signal to the base station by using the preamble; the set of zero-correction zone lengths is such a set of zero-correlation zone lengths; for any cell radius, the maximum number of preambles determined by a zero-correlation zone length selected from the set of zero-correlation zone lengths selected is the closest to the maximum number of preambles determined by any one zero-correlation zone length selected from a set of all integers, wherein the maximum number of preambles is determined by the length of the root sequence and the selected zero-correlation zone length. [Translation at p. 13] . . . the mobile terminal is used for generating a preamble based on the zero-correction zone length designated by the base station and sending an uplink signal to the base station by using the preamble; [Translation at p. 13] When a mobile terminal initiates a random access procedure, the mobile terminal needs to transmit one of the 64 preambles. In addition, the mobile terminal can transmit a message to the base station by selecting a specific preamble. [Translation at p. 6]
transmitting, by the UE, the selected random access preamble,	. . . the mobile terminal is used for generating a preamble based on the zero-correction zone length designated by the base station and sending an uplink signal to the base station by using the preamble; [Translation at p. 13] In a mobile communication system, generally, a mobile terminal sends a Random Access Preamble to a base station to perform initialization of a random access procedure and achieve synchronization with a base station. [Translation at p. 6] When a mobile terminal initiates a random access procedure, the mobile terminal needs to transmit one of the 64 preambles. In addition, the mobile terminal can transmit a message to the base station by selecting a specific preamble.

Claim	Chinese Priority Application
	[Translation at p. 6]
wherein the set of random access preambles is provided with Zero Correlation Zones of length N_{CS}-1,	Since the cell radius supported in E-UTRA is from 1 km to 100 km, and the N_{CS} should be as small as possible for any known cell, there is a need for multiple N_{CS} values. In a cell, the N_{CS} value is broadcast by a base station to a mobile terminal. Certainly, the base station may also broadcast the ZCZ length to the mobile terminal so that the mobile terminal knows how to generate the preamble. Therefore, in the broadcast channel, as little signaling as possible should be used to save overhead. Therefore, in order to achieve low signaling overhead, there must be a predefined set of finite N_{CS} values or a set of ZCZ lengths. [Translation at p. 8] In summary, in the embodiments of the present invention, a finite set of selected N_{CS} values should be such that, within a range of a plurality of cell radii, the maximum relative difference between the maximum number of ZCZ random access preambles determined by one NCS value in the finite set and the maximum number of ZCZ random access preambles obtained from any one of the NCS values in any one set of integers is the smallest. Further, a finite set of ZCZ lengths can be selected. Certainly, within a range of a plurality of cell radii, the maximum relative difference between the maximum number of ZCZ random access preambles determined by one ZCZ length in the finite set of ZCZ lengths and the maximum number of ZCZ random access preambles obtained by any one ZCZ length in a set of all integers is the smallest. [Translation at p. 14] Therefore, a preamble set defined by the cyclic shift of the root sequence based on (1) is a ZCZ sequence set whose ZCZ length is T = $N_{CS} - 1$. [Translation at p. 7]
where N_{CS} is a cyclic shift increment selected from a pre-defined set of cyclic shift increments, the pre-defined set including all of the following cyclic shift increments of 0, 13, 15, 18, 22,	In an embodiment of the present invention, it is necessary to construct a finite set of such N_{CS} values, i.e., to ensure that the N_{pre} corresponding to the smallest N_{CS} value selected from this finite set is the closest to the N_{pre} corresponding to the smallest N_{CS} value selected from a set of all integers. [Translation at p. 10] Assume that in the preambles with $T_{pre} = 800us$, $N_{ZC} = 839$, and $T_S = T_{pre}/N_{ZC}$, the delay spread is 5 us for all cell radii. [Translation at p. 10]

Claim	Chinese Priority Application
26, 32, 38, 46, 59, 76, 93, 119, 167, 279, 419.	For all cell radii, the maximum relative difference between A(R) and B(R) can be used as a measure of the deviation between A(R) and B(R), and the set of NCS values that minimizes the deviation of the measurement is found. This set can consist of an N_{CS} with $N_{CS} = 0$ and K + 1 non-zero values, and the total number of N_{CS} values in the set is K + 2. In a smaller cell, if $N_{CS} = \lfloor N_{ZC}/64 \rfloor$, 64 ZCZ preambles can be generated from a single root sequence, and this value is the minimum in the set $N_{CS}(k)$. The maximum $N_{CS}(K)$, which allows two ZCZ sequences to be generated from a single root sequence, is $\lfloor N_{ZC}/2 \rfloor$. For the largest cell, only one random access preamble is generated for each root sequence. Therefore, NCS(K+1) = 0. [Translation at p. 11] Thus, a set of values $\{N_{pre}(k)\}_{k=0}^{K}$ that minimizes D_{max} can be found. Replace D_k in $N_{pre}(k) = (1 - D_k)(N_{pre}(k-1) - 1)$ with D and rearrange it to establish the following linear difference equation: $$N_{pre}(k) - aN_{pre}(k-1) = -a, a = (1 - D).$$ From the preceding equation, $N_{pre}(k) = N_{pre}(0)a^k + \frac{a}{1-a}(a^k - 1)$ can be recursively obtained. Then, by the preceding equation recursively obtained and the boundary conditions $N_{pre}(0) = 64$ and $N_{pre}(K) = 2$, "a" can be determined numerically. Approximate minimization with a sub-optimal algorithm ensures that the maximum relative difference is minimized. In other words, the relative difference in the maximum assumed real number of zero-correlation zone random access preambles is minimized to quantify the maximum number of zero-correlation zone random access preambles. The specific method is described as follows. By initially rounding the value of the maximum assumed real number $N_{pre}(K)$ in $N_{pre}(k) = N_{pre}(0)a^k + \frac{a}{1-a}(a^k - 1)$, the following equation can be obtained: $$N_{CS}(k) = \lfloor N_{ZC}/[64 \times a^k + a/(1-a) \times (a^k - 1)] \rfloor,$$ wherein $[x]$ denotes the nearest integer to x. Finally, the real integer value of $N_{pre}(K)$ is obtained from $N_{pre}(k) = \lfloor N_{ZC}/N_{CS}(k) \rfloor$. In other words, some value of k is larger than the

Claim	Chinese Priority Application
	rounded value. As shown in Figure 2, when $K = 14$, the value of D_k obtained from the real integer value of $N_{pre}(k)$ is $D = 0.144$. [Translation at p. 12] It can be seen from Figure 2 that the real integer value of $N_{pre}(k)$ will cause D_k to deviate from D. However, the deviation is still small for all remaining cells except for the two largest cells. Therefore, a finite set of the selected N_{CS} values is suitable and available. It should be noted that, if a finite set of N_{CS} values is determined, a finite set of ZCZ lengths can also be determined, which may be specifically based on $T = N_{CS} - 1$. [Translation at p. 13]

70. As shown in the citations above, the Chinese priority application explains that k ranges from 0 to K. The "set of values $\{N_{pre}(k)\}_{k=0}^{K}$ " is used to calculate the equation for $N_{CS}(k)$ (i.e., $N_{CS}(k) = \left\lfloor \frac{N_{ZC}}{[64\times a^k + a/(1-a)\times(a^k-1)]} \right\rfloor$) by providing the values for k. The Chinese patent application also explains that K = 14. Thus, the equation for $N_{CS}(k)$ is determined for values of k from 0 to 14.

71. Using the equation for $N_{CS}(k)$ and values provided in the Chinese patent application for "a" (*i.e.*, a=(1-D) where D=0.144) and "N_{ZC}" (*i.e.*, 839), yields the following cyclic shift increments by filling in the equation above:

13, 15, 18, 22, 26, 32, 38, 46, 59, 76, 93, 119, 167, 279, 419

72. In addition, the Chinese patent application explains that for the largest cells, the sequence is not shifted at all, which is a cyclic shift increment of 0. Accordingly, it explains that "[f]or the largest cell, only one random access preamble is generated for each root sequence. Therefore, $N_{CS}(K+1) = 0$." Translation at p. 11. With the addition of a zero shift, the Chinese patent application discloses the entire list of cyclic shift increments in the claims. The inventor, Mr. Mauritz, confirmed that at his deposition:

> Q. Do you agree that Exhibit 1244, the invention disclosure, discloses the cyclic shift increments in table two in the patent uniquely?
>
> A. Yes.

Mauritz Dep. 169:14-17[3]; *see also id.* at 166:14-169:10.

73. One of skill in the art at the time of the invention would understand how to put values in the equation disclosed in the Chinese priority application to get the cyclic shift increments in the claims. Indeed, filling values into the equation given in the Chinese priority application is basic algebra that any one qualified in the field would be able to do easily.

74. Claim 10 contains the same functionality as claim 1 but is an apparatus claim requiring a "processor" and a "non-transitory computer readable storage medium storing programming for execution by the processor." The programming is then claimed as "including instructions that direct the processor to" perform the functions in claim 1.

75. With respect to these functions, the Chinese patent application discloses the claimed functionality in claim 10 for the same reasons that it discloses that functionality in claim 1, as described above.

76. With respect to the "processor" and a "non-transitory computer readable storage medium storing programming for execution by the processor," the Chinese patent application inherently discloses those structures. The Chinese patent application discloses a "mobile terminal" that "is used for generating a preamble based on the zero-correction zone length designated by the base station and sending an uplink signal to the base station by using the preamble." Translation at p. 13. One of skill in the art at the time of the invention would know that a "mobile terminal"

[3] The cited Mr. Mauritz's deposition testimony relates to Mr. Mauritz's Invention Disclosure (Mauritz. Dep. Ex. 1244) to Huawei that formed the basis for Huawei's Chinese patent application. I have compared Mr. Mauritz's Invention Disclosure to the Translation. The method for calculating the cyclic shift increments disclosed in Mr. Mauritz's Invention Disclosure is identical to the method disclosed in the Chinese patent application.

would contain a processor, at least one non-transitory computer readable storage medium, and instructions stored in that medium for execution by the processor. At that time, mobile terminals contained processors to execute instructions to perform functionality such as that described in the claims. Those instructions, at that time, would have been held in a non-transitory computer readable storage medium such as flash memory such that the instructions would not disappear when power was removed from the mobile terminal.

77. The Chinese patent application also discloses that the processor performs those functions as directed by programming instructions. At the time of the invention, a mobile terminal would perform the claimed functionality using programming instructions stored in a non-transitory computer storage medium such as flash memory.

D. Prosecution History

78. U.S. Patent Application 13/291,727 ("the '727 Application"), which issued as the '892 Patent, was filed on November 8, 2011. '892 Patent at Cover; '892 File History at HW_Samsung_00038508. The '727 Application was a continuation of Application 12/605,616 filed on October 26, 2009, which is a continuation of Application PCT/CN2008/070768 filed on April 22, 2008. '892 Patent at Cover.

79. The original application recited 20 claims. Original claims 1 and 10 recited:

> 1. A method of selecting and transmitting a random access preamble in a mobile communication system, comprising:
>
> selecting a random access preamble from a set of random access preambles; and
>
> transmitting the selected random access preamble, wherein the set of random access preambles is provided with Zero Correlation Zones of length N_{CS}-1, the N_{CS} is a cyclic shift increment selected from a set of cyclic shift increments {0, 13, 15, 18, 22, 26, 32, 38, 46, 59, 76, 93, 119, 167, 279, 419}.

'892 File History at HW_Samsung_00038544.

overcoming the patent examiner's prior determination of patentability of the '892 Patent claims.

G. A Number of References Dr. Madisetti Relies Upon Are Not Prior Art

241. As explained above, claims 1 and 10 of the '892 Patent are entitled to at least the April 30, 2007 priority date. *See supra* § VI.C.

242. As explained above, R1-072330 is not prior art to the '892 Patent. *See supra* § VII.D.1. For this reason, the following references and combinations Dr. Madisetti relies upon cannot render obvious claim 1 or 10 of the '892 Patent:

- R1-072330
- R1-072330 and Bertrand

243. As explained above, Lee'325 is not prior art to the '892 Patent. *See supra* § VII.E.1. For this reason, the following references and combinations Dr. Madisetti relies upon cannot render obvious claim 1 or 10 of the '892 Patent:

- Lee'325 and Bertrand

244. As explained above, Lee'698 is not prior art to the '892 Patent. *See supra* § VII.F.1. Therefore, the following references and combinations Dr. Madisetti relies upon cannot render obvious claim 1 or 10 of the '892 Patent:

- Lee'698
- Lee'698 and Bertrand

IX. OPINIONS REGARDING PATENT ELIGIBILITY

245. The first step in my analysis is to determine whether a claim is directed to a patent-ineligible concept, such as a law of nature, natural phenomena, or abstract idea. In my opinion, claims 1 and 10 of the '892 Patent are not directed to a law of nature, natural phenomena, or abstract idea. Rather, they are directed to an improvement in the random access procedure used by mobile devices to connect to a base station.